Tampon having Liquid-Resistant Base

Field of the Invention

The present invention relates to a tampon having an overwrap material disposed on absorbent material, the overwrap material has a liquid-permeable zone and a liquid-resistant zone, and the liquid-resistant zone of the overwrap material forms a fold over an edge of the absorbent material.

Background of the Invention

An overwrapped, spirally wound tampon is disclosed in Friese, US Pat. No. 4,816,100. This tampon has a liquid-permeable, thermoplastic strip section bonded by heat-sealing to the outside of the nonwoven web section. The outer end of the strip section, which projects beyond the end of the nonwoven web section, is bonded to the outside of part of the strip section sealed to the nonwoven web section. Both the insertion and withdrawal end of the tampon remain free of the overwrap material. Although heat-sealing this liquid-permeable thermoplastic strip section to the absorbent structure provided a significant advance in the art, significantly reducing the number of absorbent fibers that could slough off of the tampon, additional improvements to tampon leakage continue to be sought.

Another overwrapped, spirally wound tampon is disclosed in Brown, Jr., US Pat. No. 5,185,010. This tampon has an absorbent material wound in a spiral configuration, the outermost winding of the spiral having a liquid permeable overwrap material disposed thereon, a portion of said overwrap being folded over the edge of the spiral which corresponds to the withdrawal end of the tampon and adhered to the inside surface of the outermost winding. While this illustrates an alternative way to bond the cover to the absorbent structure, it fails to address early tampon leakage problems.

Yet another tampon is disclosed in Kraemer, US Ser. No. 10/285,099, filed October 31, 2002. This tampon has an introduction end, with a recovery end, from which a withdrawal string extends. A first region, which extends from the introduction end in the direction of the recovery end, comprises a first material. A second region, located near the recovery end of the tampon, comprises a second material. The first material has a higher absorbency and a higher hydrophilicity than the second material. The diameter of the second region is at least as large as the mean diameter of the first region. During the absorption of fluid, the second region expands at least essentially perpendicularly to the longitudinal axis of the tampon.

While there are illustrated developments in providing thermoplastic covers to tampons and attempts to reduce early tampon leakage, a tampon is needed that contains absorbent fibers, that exhibits enhanced ability to reduce early tampon leakage, and that is easily manufactured in modern, high-speed tampon manufacturing equipment.

Summary of the Invention

It has been discovered that a tampon having an overwrap material disposed on absorbent material, the overwrap material has a liquid-permeable zone and a liquid-resistant zone, and the liquid-resistant zone of the overwrap material forms a fold over an edge of the absorbent material can offer improved fluid containment within its absorbent structure.

In one aspect of the invention, the tampon includes an overwrap material disposed on an absorbent material. The overwrap material has a length greater than the length of the absorbent material and a width generally corresponding to the width of the absorbent material. The overwrap material also has a liquid-permeable zone and a liquid-resistant zone, and the liquid-resistant zone of the overwrap

material forms a fold over an edge of the absorbent material disposed at the withdrawal end of the tampon.

In another aspect of the invention, the tampon is formed by attaching a length of overwrap material having a liquid-permeable zone and a liquid-resistant zone to an absorbent material to form a laminate; folding a portion of the liquid-resistant zone over an edge of the absorbent material; and forming the laminate into a tampon, wherein the folded portion of the liquid-resistant zone of the overwrap material is located at the withdrawal end of the tampon.

In yet another aspect of the invention, the tampon is formed through a series of steps. A laminate is formed by attaching a plurality of spaced-apart, individual absorbent material web pads to a substantially continuous web of overwrap material having a liquid-permeable zone and a liquid-resistant zone. Each individual absorbent material web pad has a length that is oriented parallel to the substantially continuous length of overwrap material and a width. In addition, a portion of the liquid-resistant zone is folded over an edge of the individual absorbent material web pads corresponding to the withdrawal end of the finished tampon. A construction comprising one individual absorbent material web pad and a section of the overwrap material is separated from the laminate. The construction has a tab formed of an extension of the overwrap material beyond a longitudinal end of the individual absorbent material web pad. A withdrawal string can be looped around an intermediate portion of the construction, generally parallel to the width of the individual absorbent material web pad. Winding the construction about an axis parallel to the width of the individual absorbent material web pad can form a substantially cylindrical tampon blank with the withdrawal string extending from the withdrawal end of it. Attaching the tab to a portion of the overwrap material disposed on the surface of the tampon blank can prevent it from unwinding, and the tampon blank can be formed into a tampon, e.g., by compression.

Other aspects and features of the present invention will become apparent in those ordinarily skilled in the art upon review of the following description of specific embodiments of the invention in conjunction with the accompanying drawings.

Brief Description of the Drawing

FIG. 1 shows a perspective view of a tampon according to the invention.

FIGS. 2a-f show a diagrammatic view of process steps useful to produce a tampon according to the invention.

FIG. 3 shows cross-section along plane 3-3 in FIG. 2f.

FIG. 4 shows a diagrammatic view of an alternative embodiment (similar to the view of 2a) in which the overwrap includes two different materials

FIG. 5 shows a diagrammatic view of an apparatus for producing a tampon according to the invention.

Detailed Description of the Preferred Embodiments

As used herein the specification and the claims, the term "spiral" and variants thereof relate to winding around a center or pole and gradually receding from or approaching it.

Referring to Fig. 1, there is shown an embodiment of the present invention, a feminine tampon 2. The tampon 2 has an absorbent structure comprising an absorbent material 4, and the tampon 2 has an introduction end 6 and an opposite withdrawal end 8. An overwrap material 10 is disposed on absorbent material 4 as described further, below. The overwrap material 10 forms a fold 12 over an edge 14 of the absorbent material 4, and it has a liquid-permeable zone 16 and a liquid-resistant zone 18. The fold 12 is located in the liquid-resistant zone 18. The tampon 2 also has a withdrawal string 20 extending from the withdrawal end 8.

Absorbent tampons are usually substantially cylindrical masses of compressed absorbent material having a central axis and a radius that defines the outer circumferential surface of the tampon. Tampons are often formed by first obtaining a shaped mass of absorbent material called a tampon blank. This blank can be in the form of a roll of sheet-like material, a segment of a continuous absorbent material, a mass of randomly or substantially uniformly oriented absorbent material, an individually prepared or cast mass of absorbent material, and the like.

The tampon blank is relatively uncompressed and has a relatively low density. The overwrap substantially encloses the tampon blank, and the overwrap encloses a majority of the outer surface of the tampon. The blank may then be compressed to form a product having overall dimensions less than those of the blank prior to use. The compressed tampons may have a generally uniform density throughout the tampon, or they may have regions of differing density as described in the commonly assigned applications to Friese et al., US Pat. No. 6,310,296, and Leutwyler et al., US Pat. No. 5,911,712, the disclosures of which are herein incorporated by reference.

The overwrap can ease the insertion of the tampon into the body cavity and can reduce the possibility of fibers being separated from the tampon. Those of ordinary skill in the art are familiar with materials that are useful in forming overwraps. Overwrap materials may be selected from an outer layer of fibers that are fused together (such as by thermobonding), a nonwoven fabric, an apertured film, or the like.

As indicated above, the overwrap material has at least two zones: a liquid-permeable zone 16 and a liquid-resistant zone 18. This may be achieved by converting a portion of a liquid-permeable material into a liquid-impermeable material, such as by impregnating a liquid-permeable nonwoven web with a liquid-

resistant coating. Alternatively, it may be achieved by converting a portion of a liquid-impermeable material into a liquid-permeable material, such as by selectively aperturing a liquid-impermeable plastic film. It may also be achieved by combining two different materials, one liquid-permeable and the other liquid-impermeable.

The materials that may be used in the tampon include fibers, foams, and particles or other discrete materials. The materials may be polymeric or cellulosic. A representative, non-limiting list of useful materials, including fibrous materials, includes, cellulose, polyester, polyvinyl alcohol, polyolefin, polyamine, polyamide, polyacrylonitrile, and the like. A representative, non-limiting list of useful cellulosic fibers includes natural fibers such as cotton, wood pulp, jute, hemp, sphagnum, and the like; and processed materials including cellulose derivatives such as regenerated cellulose (including rayon and lyocell), cellulose nitrate, carboxymethyl cellulose, and the like.

Compressed tampons rebound slightly after moderate mechanical compression toward their original dimensions. Therefore, tampon blanks are generally over-compressed to allow them to rebound slightly to the desired density for use. Over-compression mechanically constricts expansion to prevent the tampon from expanding without added liquid.

A preferred technique for winding and assembling a tampon of the invention is illustrated in FIGS. 2a-2e.

FIG. 2a shows a substantially continuous length of the overwrap material 10 and the liquid-permeable zone 16 and the liquid-resistant zone 18. Separation lines 22 are also shown, and these lines 22 may be lines of weakness or simply an indication where sections of the overwrap material 10 and absorbent material 4 will later be separated.

As shown in FIG. 2b, sections of absorbent material 4 are attached to overwrap material 10, e.g., through seal 24. Overwrap material 10 extends beyond

outer end 26 of absorbent material 4, forming a tab 28. In a preferred embodiment, the overwrap material 10 is cut in a rectangle, and the overwrap material 10 is folded over itself in the area of tab 28, forming a double thickness of material in that area.

In FIG. 2c, overwrap material 10 is folded over edge 18 of absorbent material 4, in the direction indicated by arrow A. A widthwise seal 30 can be formed at one or more places along the construction to retain the overwrap 10 in its folded over position. As shown in FIG. 2c, a widthwise seal 30 may be located near the inner end 32 of the construction and another widthwise seal 30 may be located nearer the outer end 26 of the absorbent material 4.

The widthwise seal 30 is also shown in FIG. 2d, and the withdrawal string 20 is looped over an area of the overwrap/absorbent construction near its middle. The construction can then be wound in the direction indicated by arrow B to form the spiral tampon blank 34 shown in FIG. 2e. This may be achieved, generally as disclosed in Friese, U.S. Patent No. 4,816,100, the disclosure of which is herein incorporated by reference. The skilled artisan will recognize that the overwrap of the present invention is the continuous material, while in Friese; it is the absorbent material that is the continuous material. The outermost winding of the spiral (reference number 36 in FIG. 2) is entirely covered by overwrap material 10, and widthwise seal 30 will be covered either by end 26 of absorbent material 4 (preferably) or by tab 28 of overwrap material 10. After the final winding of the absorbent material, tab 28 is wound around the overwrapped surface in the direction indicated by arrow C.

Finally, as shown in FIG. 2f, tab seal 38 attaches tab 28 to the overwrapped surface. In this embodiment, tab seal 38 is a discontinuous (intermittent) seal, to enhance the softness of the sealed area. In other embodiments, tab seal 38 may be continuous. FIG. 3 shows cross-section along plane 3-3 of this structure. In this

cross-section, one can see the liquid-impermeable material folded over the edge 14 of the absorbent material 4.

Seals 24, 30, and 38 are preferably all heat seals, and accordingly it is preferred that the overwrap be a heat sealable thermoplastic. It is preferred that the seals be intermittent, particularly the overwrap-to-overwrap seal (seal 38) that will be exposed in the assembled tampon and is thus is preferably soft. However, continuous seals may be used, and the seals may be either smooth or textured, as desired. Appropriate sealing techniques are known in the art.

FIG. 4 shows an alternative embodiment in which the overwrap 10 comprises two different materials, one liquid-permeable 16' and the other liquid-impermeable 18'. In this alternative embodiment (similar to FIG. 2a, above), two separate webs are combined, off-set from each other to provide the liquid-permeable zone 16 and the liquid-impermeable zone 18. For example, the liquid-permeable material 16' may be a nonwoven web, an apertured film, or the like, and the liquid-impermeable material 18' may be a nonwoven web, a plastic film, or the like. These two materials may overlap slightly to permit them to be bonded, e.g., by thermobonding, ultrasonic sealing or glueing. The bonding line may be continuous or intermittent.

FIG. 5 shows a diagrammatic view of an apparatus for producing a tampon according to the invention. A loose web of fibrous material 100 is fed into a calendar 102 to provide a continuous web of absorbent material 4. The web of absorbent material 4 may be guided into a second calendar, an in-line calendar and feed nip 104, by means of an optional edge guide (not shown). The in-line calendar and feed nip 104 feeds the web of absorbent material 4 to a cut & place unit 106. The cut & place unit 106 may have two rotating vacuum drums 106a and 106b and a cutting roller 108. Preferably, the rotating vacuum drums 106a and 106b rotate faster than the rate at which the absorbent material 4 is provided by the in-line

calendar and feed nip 104 to space individual absorbent material pads 4a along the circumference of the rotating vacuum drums 106a and 106b. The first rotating vacuum drum 106a transfers the individual absorbent material pads 4a to the second rotating vacuum drum 106b. As the individual absorbent material pads 4a are carried by the second rotating vacuum drum 106b, they are transferred to a continuous web of overwrap material 10 in the nip between the second rotating vacuum drum 106b and auxiliary roller 110.

After the absorbent material pads 4a are carried out of the cut & place unit 106 by the continuous web of overwrap material 10, a fold-around board 112 folds an edge portion of the liquid-resistant zone of the overwrap material 10 over an edge of the absorbent material pads 4a. The resulting fold 12 is thus located in the liquid-resistant zone.

The overwrap material 10 and the absorbent material 4 can then be secured together in a bonding unit 114. The two elements can be secured through heat and pressure, thermobonding, ultrasonic bonding, and the like. Finally, the construction may pass through a cutting station 116 and onto a conveyor 118. The cutting station 116 may be substantially as described in Friese, US Pat. No. 4,816,100, or it may be a cutting station in which the product is completely severed and delivered to the conveyor 118. Those of ordinary skill in the art will also recognize other suitable technologies for the cutting station 116.

The specification and embodiments above are presented to aid in the complete and non-limiting understanding of the invention disclosed herein. Since many variations and embodiments of the invention can be made without departing from its spirit and scope, the invention resides in the claims hereinafter appended.